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PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2000-162438

(43)Date of publication of application : 16.06.2000

(51)Int.Cl. G02B 5/30
G02F 1/1335

(21)Application number : 10-353890

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(22)Date of filing : 26.11.1998

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(54) POLARIZING PLATE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a polarizing plate capable of preventing a polarized light separation sheet from being damaged even when the sheet is arranged adjacently to it and of effectively preventing its sticking.

SOLUTION: A polarizing plate 1 is made to have minute irregular structure (s) 11 on its one or both surfaces. The irregular structure has a center line average roughness of 0.01-0.1 μm , ten or more protruding parts of 0.5 to 1.0 μm height and two or less protruding parts of more than 1.0 μm height on an arbitrary straight line of 1 mm length, and a surface hardness of H-4H expressed as a pencil hardness. Thereby, sticking of the polarizing plate can be prevented, and the damage to an adjacent optical sheet can be prevented, even when it consists of a soft film, to form a liquid crystal display device being excellent in luminance, display quality, etc.



LEGAL STATUS

[Date of request for examination] 03.07.2002

[Date of sending the examiner's decision of

[rejection]

[Kind of final disposal of application other than
the examiner's decision of rejection or
application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's
decision of rejection]

[Date of requesting appeal against examiner's
decision of rejection]

[Date of extinction of right]

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CLAIMS

[Claim(s)]

[Claim 1] The polarizing plate which the heights of ten or more pieces, and height ** of 1.0 micrometers are [heights with a height of 0.5-1.0 micrometers] two or less pieces, and is characterized by surface hardness having the detailed irregularity structure of H-4H by the pencil degree of hardness on a straight line with an arbitrary length of 1mm on a piece front face or both front faces while center line average coarseness is 0.01-0.1 micrometers.

[Claim 2] The polarizing plate with which detailed irregularity structure consists of an ultraviolet-rays hardening resin layer containing the spherical particle which is 0.5-5 micrometers of mean particle diameters in a claim 1.

[Claim 3] The polarizing plate in the state where set to a claim 1 or 2 and it has been arranged between the liquid crystal cell by the side of the check-by-looking tooth back of a liquid crystal cell, and an optical sheet.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] Preventing with [of a contiguity optical sheet] a blemish, it can prevent sticking and this invention relates to the suitable polarizing plate for formation of a liquid crystal display etc.

[0002]

[Background of the Invention] The liquid crystal display which has arranged the polarizing plate and the liquid crystal cell one by one through the optical sheet which consists of for example, a diffusion sheet, a condensing sheet, a polarization separation sheet, etc. on a back light is proposed. This arrangement structure raises the use efficiency of light, and it is made to raise the brightness of a liquid crystal display by controlling the optical path by the condensing sheet, introducing into a polarization separation sheet, after diffusing the outgoing radiation light by the back light with a diffusion sheet, changing the aforementioned outgoing radiation light into polarization, and introducing into a polarizing plate. However, the polarizing plate and the adjoining optical sheet stuck, the sticking phenomenon was caused, and there was a difficulty that display grace falls.

[0003] In order that this invention persons might prevent sticking of a polarizing plate and an adjoining optical sheet in view of the above, it tried to arrange conventionally what is well-known as an anti glare polarizing plate arranged for the purpose of **** etc. at the check-by-looking side of display that has concavo-convex structure on a front face to the light source side of a liquid crystal cell.

[0004] however -- although sticking was prevented by that cause -- the optical sheet of contiguity with the concavo-convex structure of the anti glare front face of a polarizing plate -- getting damaged -- etc. - - it became clear that there is a trouble damaged When the polarization separation sheet especially described above adjoins a polarizing plate, since this polarization separation sheet is an elasticity film while it consists of a smooth front face and is easy to produce sticking like the circular polarization of light separation sheet which has the linearly polarized light separation sheet which has the multilayer of a refractive-index anisotropy, and a cholesteric-liquid-crystal layer, it tends to get damaged, the blemish becomes with a scattered about point etc., an optical function is prevented, and display grace falls remarkably.

[0005]

[The technical technical problem of invention] this invention makes a technical problem development of the polarizing plate which can prevent with [the] a blemish even if it carries out contiguity arrangement with a polarization separation sheet, and can also prevent sticking effectively.

[0006]

[Means for Solving the Problem] While center line average coarseness is 0.01-0.1 micrometers on a piece front face or both front faces, as for this invention, heights with a height of 0.5-1.0 micrometers offer the polarizing plate with which the heights of ten or more pieces, and height ** of 1.0 micrometers are two or less pieces, and surface hardness is characterized by having the detailed irregularity structure of H-4H by the pencil degree of hardness on a straight line with an arbitrary length of 1mm.

[0007]

[Effect of the Invention] While being able to prevent sticking with an adjoining optical sheet effectively based on the detailed irregularity structure of having the above-mentioned detailed and moderate surface hardness according to this invention, when the contiguity optical sheet consists of elasticity films, such as a polarization separation sheet, it can prevent with [the] a blemish, and the polarizing plate which can form the liquid crystal display which is excellent in brightness, display grace, etc. can be obtained.

[0008]

[The operation form of invention] On a piece front face or both front faces, while center line average coarseness is 0.01-0.1 micrometers, on a straight line with an arbitrary length of 1mm, heights with a height of 0.5-1.0 micrometers are [the heights of ten or more pieces, and height ** of 1.0 micrometers] two or less pieces, and, as for the polarizing plate by this invention, surface hardness has the detailed irregularity structure of H-4H by the pencil degree of hardness. The example was shown in drawing 1 and drawing 2. 1 is a polarizing plate and 11, 15, and 16 are detailed irregularity structure sides.

[0009] A proper thing can be used for the polarizing plate of the object which gives detailed irregularity structure to a front face, and there is especially no limitation about the kind. Incidentally as the example, polarization films, such as a polyene oriented film like the thing and the dehydration processing object of polyvinyl alcohol which dichroism matter, such as iodine and a dichromatic dye, was made to stick to the hydrophilic high polymer film like a polyvinyl alcohol system film, a partial formalized polyvinyl alcohol system film, and an ethylene-vinylacetate-copolymer system partial saponification film, and were extended, or the desalting acid-treatment object of a polyvinyl chloride, etc. are raised. Although the thickness of a polarization film has common 5-80 micrometers, it is not limited to this.

[0010] Moreover, what formed the transparent protection layer 12 and 14 which consists of an application layer of polymer, a lamination layer of a film, etc. is raised for the purpose of [, such as water resistance,] protection to said one side or both sides of the polarization film 13 like the example of drawing. Although proper things, such as transparent polymer, can be used for formation of transparent protection layer, what is excellent in transparency, a mechanical strength and thermal stability, moisture cover nature, etc. can use preferably. Moreover, transparent protection layer is so desirable that there are few optical anisotropies, such as phase contrast, in many cases. Although the thickness of transparent protection layer has common 10-300 micrometers, it is not limited to this.

[0011] As polymer which incidentally forms the aforementioned transparent protection layer, polyester system polymer, the cellulose system polymer like a diacetyl cellulose or a cellulose triacetate, polycarbonate system polymer, the acrylic polymer like a polymethylmethacrylate (PMMA), polystyrene, styrene system polymer like an acrylonitrile styrene copolymer (AS resin) like a polyethylene terephthalate or polyethylenenaphthalate, etc. are raised, for example.

[0012] Moreover, the olefin system polymer like the polyolefine which has polyethylene, polypropylene, a cyclo system, or norbornene structure, or an ethylene propylene rubber, Vinyl chloride system polymer, nylon and amide system polymer like an aromatic polyamide, Imido ** polymer, sulfone system polymer, polyether sulphone system polymer and polyether ether ketone system polymer, Polyphenylene-sulfide system polymer and vinyl alcohol system polymer, It is raised as an example of the polymer in which the blend object of vinylidene-chloride system polymer, vinyl butyral system polymer, ant rate system polymer and polyoxymethylene system polymer, epoxy system polymer, or the aforementioned polymer etc. forms the aforementioned transparent protection layer.

[0013] The polarizing plate by this invention has the detailed irregularity structures 11, 15, and 16 on the piece front face or both front faces like the example of drawing, while the detailed irregularity structure is 0.01-0.1 micrometers in center line average coarseness, it has ten or more heights with a height of 0.5-1.0 micrometers on a straight line with an arbitrary length of 1mm, and the heights of height ** of 1.0 micrometers are two or less pieces, and the surface hardness based on a pencil degree of hardness is H-4H.

[0014] Arithmetical mean deviation of profile in the aforementioned detailed irregularity structure cannot prevent sticking in less than 0.01 micrometers, but if it exceeds 0.1 micrometers, it will generate with a blemish. Moreover, when a straight line with an arbitrary length of 1mm is prepared in the front face of detailed irregularity structure, the heights with a height of 0.5-1.0 micrometers located on the

line cannot prevent sticking in less than ten pieces, but if the heights of height ** of 1.0 micrometers exceed two pieces, it will generate with a blemish.

[0015] Furthermore, it is [become] easy to be generated with a blemish in a detailed irregularity structure side by surface hardness by the pencil degree of hardness under at H, the handling nature at the time of work etc. falls, and if 4H are exceeded, it will be generated with a blemish on a contiguity optical sheet. In addition, the aforementioned height h is based on the distance between the maximum partes basilaris ossis occipitalis between the peak of the heights 18 in the front face 19 of detailed irregularity structure, and the heights of contiguity in it like instantiation at drawing 3.

[0016] It gets damaged. detailed irregularity structure more desirable than the point of the balance of prevention and sticking prevention The 50 or more numbers of heights with a height [coarseness / center line average / on 0.04-0.09 micrometers and a straight line with an arbitrary length of 1mm] of 0.5-1.0 micrometers especially 100 or more pieces above all 0.03 micrometers or more 0.02 micrometers or more by 150 or more pieces The one or less number of the heights of height ** of 1.0 micrometers is zero piece above all, and the surface hardness based on a pencil degree of hardness is 2H-3H.

[0017] The detailed irregularity structure in the front face of a polarizing plate may be formed by the proper method that what is necessary is just what has the above-mentioned property. Incidentally as the example, what gave detailed irregularity structure to the front face, the resin layer which carries out distributed content of the particle are raised with the imprint method by the thing and metal mold which split-face--ization-processed by proper methods, such as sandblasting, and an embossing roll, chemical etching, and gave detailed irregularity structure to the front face etc.

[0018] Therefore, detailed irregularity structure can be formed in the front face of the transparent protection layer in the above-mentioned polarizing plate like the things 11 and 16 illustrated to drawing 1 or drawing 2 as a layer which serves as the transparent protection layer which comes to give detailed irregularity structure.

[0019] Moreover, detailed irregularity structure can be formed like the thing 15 illustrated to drawing 2 also as what prepared the coating layer of polymer on the addition layer which consists of a coating layer of the aforementioned resin layer to the transparent protection layer 12 of a polarizing plate etc., the processing layer which gave detailed irregularity structure on the front face of the polymer layer which carried out coating addition at transparent protection layer, or the transparent protection layer which gave detailed irregularity structure on the surface of the above. Detailed irregularity structure may be formed as a layer which compounded the thing of two or more sorts of said states.

[0020] In the above, or it serves as the transparent protection layer of a polarizing plate, what consists of a resin layer of the particle content formed as a layer replaced with transparent protection layer is more desirable than points, such as the formation nature of the above-mentioned concavo-convex property. The resin layer can be formed by the method with proper method which for example, a resin solution is made to carry out distributed content of the particle, carries out coating of it on a polarizing plate by proper methods, such as a doctor blade method and the gravure roll coater method, and forms a coating film, method which pastes it up on a polarizing plate by forming the resin film of particle content beforehand.

[0021] In addition, the polymer illustrated in the above-mentioned transparent protection layer can be suitably used for the resin which forms the aforementioned resin layer according to the degree of hardness etc. What can be used preferably is an ultraviolet-rays hardening type resin. According to this, the layer which consists of an ultraviolet-rays hardening resin layer which contains a particle if needed by hardening processing of the coating layer by UV irradiation can be efficiently formed by easy processing operation. Moreover, it can perform easily forming an ultraviolet-rays hardening resin layer in the split-face-ized front face of transparent protection layer, and making the surface irregularity of transparent protection layer reflect in the front face etc.

[0022] An ultraviolet-rays polymerization initiator is blended with the monomer, oligomer, and polymer which can form resins, such as a polyester system, acrylic, an urethane system and an amide system, a silicone system, and an epoxy system, for example as the aforementioned ultraviolet-rays hardening type resin, and what has the proper thing which enabled it to form a resin layer by the hardening processing

by UV irradiation can be used.

[0023] Above all, although the ultraviolet-rays hardening type resin which can be used preferably uses as a component the monomer and oligomer of the acrylic which it has 3-6 pieces especially two or more pieces which have the functional group of for example, ultraviolet-rays polymerization nature, when making adhesion, the transparency and hard-coat nature to the polarizing plate front face for an attachment, and a particle contain, they are like and a thing which is excellent in the dispersibility, the satisfaction nature of the above-mentioned degree of hardness of a hardening coat, etc.

[0024] In addition, as the aforementioned particle, conductive things, such as the organic system particle for which a bridge is not constructed [the bridge formation which consists of various polymer such as PMMA, polyurethane and polystyrene, and melamine resin, for example, or], a silica and an alumina, a titania and a zirconia, a calcium oxide and a tin oxide, indium oxide, and a cadmium oxide, an antimony oxide, can also use proper things, such as a certain inorganic system particle.

[0025] Above all, rather than the above-mentioned points, such as the easy achievement nature of a concavo-convex property, and formation prevention of acute angle heights, a spherical particle, especially the organic system particle which does not dissolve in the resin before hardening can use preferably. Moreover, the particle to be used has that more desirable than the point of getting damaged and making prevention and sticking prevention balancing good etc. 0.5-5 micrometers of the mean particle diameter of whose are 1-4 micrometers above all.

[0026] As illustrated to drawing 2, a glue line 17 can also be formed in a polarizing plate if needed. This glue line aims at pasting up a polarizing plate with other members, such as a liquid crystal cell. As for a glue line, what can form with adhesives with proper binders, such as acrylic, and a rubber system, a silicone system, hot-melt system adhesives, etc., and is excellent in transparency, weatherability, etc. is desirable.

[0027] The polarizing plate by this invention can be used for various kinds of uses which applied to the former, such as display, correspondingly as a phase contrast board, a pasted-up elliptically-polarized-light board if needed. Prevention of carrying out sticking between adjoining optical sheets can use for a required use etc. preferably, preventing with [of the optical sheet] a blemish, when a polarizing plate is adjoined and it arranges an optical sheet especially like a liquid crystal display. In this case, a polarizing plate is arranged so that the detailed irregularity structure side may be located between adjoining optical sheets.

[0028] Incidentally the liquid crystal display which has arranged the polarizing plate 1 by this invention to drawing 4 was illustrated. The optical diffusion sheet 7, the condensing sheet 6, and the polarization separation sheet 5 were laid in the optical outgoing radiation side of a back light 8 one by one, the polarizing plate 1 has been arranged on it, the liquid crystal cell 4 is pasted through the adhesive layer 3, and this consists of a thing of the gestalt which the polarizing plate 2 pasted up through the adhesive layer 3 on the liquid crystal cell.

[0029] Although an optical diffusion sheet, a condensing sheet, and a polarization separation sheet are optical sheets in the above, in the example of drawing, the polarization separation sheet 5 is the optical sheet of contiguity in a polarizing plate 1. Therefore, the polarizing plate 1 is arranged so that the field 11 which has the detailed irregularity structure may become a polarization separation sheet side. Thus, the structure of arranging the polarizing plate by this invention and preventing sticking and with a blemish in a liquid crystal display between the optical sheets and liquid crystal cells which are laid without a glue line is usually. Moreover, although the method which arranges the polarizing plate by this invention is common to the check-by-looking tooth-back side of a liquid crystal cell like the example of drawing, it does not restrict arranging to the check-by-looking side of a liquid crystal cell.

[0030] In addition, the aforementioned liquid crystal cell consists of what attached the light filter 41 to the check-by-looking side while enclosing the liquid crystal layer 43 between the cell substrates 42 which have a transparent electrode inside. Moreover, a back light 8 consists of a side light type thing which comes to prepare a reflecting layer 84 in the base of the light guide plate 81 which has arranged on the side the light source 82 surrounded with the electrode holder 83, and the upper condensing sheet 6 consists of what has arranged the prism sheets 6a and 6b so that those prism ridgelines may cross.

Furthermore, the polarizing plate 2 by the side of a check by looking has the anti glare layer 21 on the front face.

[0031] According to the aforementioned liquid crystal display, the outgoing radiation light by the back light 8 diffuses with the optical diffusion sheet 7, and carries out incidence to the condensing sheet 6. Then, after an optical path is controlled, while the reflected light and the transmitted light separate into the polarization separation sheet 5 very much, it is changed into polarization, and the transparency polarization passes a polarizing plate 1 in the state with few absorption losses, and penetrates a liquid crystal layer, and outgoing radiation of the display light is carried out through the polarizing plate 2 by the side of a check by looking. In this case, there being few absorption losses by the polarizing plate 1 and the reflective polarization by the polarization separation sheet can carry out reflective reversal by the reflecting layer 84 of a light guide plate, can carry out re-incidence to a polarization separation sheet, and can penetrate, and when the use efficiency of light improves by use of the reflected light, the brightness of a liquid crystal display can be raised.

[0032] In addition, although the polarization separation sheet was used as the optical sheet of contiguity in a polarizing plate in the aforementioned example of drawing, in this invention, it may not be limited to it, but the optical sheet of contiguity in a polarizing plate may be a proper thing according to the gestalt of the liquid crystal display for the purpose of formation etc.

[0033]

[Example] the example 1 urethane acrylate system ultraviolet-rays hardening type resin 100 section (the weight section --) Distributed liquid of 50 % of the weight of solid contents which mixed the spherical resin particle 20 same section of 2 micrometers of mean particle diameters, and the ultraviolet-rays polymerization initiator 3 section through the solvent below It applied to one side of a polarizing plate which pasted up the triacetyl-cellulose film with a thickness of 50 micrometers on both sides of an iodine system polyvinyl alcohol type polarization film through the polyvinyl alcohol system glue line in the bar coating machine, hardening processing was carried out through the ultraviolet rays after dryness, and the polarizing plate of surface detailed irregularity structure was obtained. The number of heights with a height [coarseness / center line average / in the surface detailed irregularity structure / on 0.08 micrometers and a straight line with an arbitrary length of 1mm] of 0.5-1.0 micrometers was [zero piece and the surface hardness of the number of the heights of 240 pieces, and height ** of 1.0 micrometers] 2H by the pencil degree of hardness.

[0034] Next, the polarizing plate was pasted up on the liquid crystal cell through the acrylic adhesive layer so that the aforementioned detailed irregularity structure side might serve as an outside, when the color type liquid crystal display of the gestalt according to drawing 4 laid on the circular polarization of light separation sheet which has the linearly polarized light separation sheet or cholesteric-liquid-crystal polymer layer which has the multilayer of a refractive-index anisotropy through the detailed irregularity structure side was formed, it did not generate but sticking was excellent also in display grace. moreover, the place which disassembled and checked equipment -- any polarization separation sheet -- getting damaged -- it was not generated

[0035] Example of comparison 1 mean particle diameter used the spherical resin particle which is 10 micrometers, and also it applies to an example 1 correspondingly. The number of heights with a height [coarseness / center line average / on 0.40 micrometers and a straight line with an arbitrary length of 1mm] of 0.5-1.0 micrometers 46 pieces, Although sticking was not generated when the polarizing plate with which the number of the heights of height ** of 1.0 micrometers has the detailed irregularity structure of 2H in 12 pieces, and surface hardness has it on a front face by the pencil degree of hardness was obtained and the color type liquid crystal display was formed using it It was the display which is hard to see, and when equipment was disassembled, it had generated with the blemish on any polarization separation sheet.

[0036] Example of comparison 2 mean particle diameter used the silica particle 0.5 section which is 10 micrometers, and also it applies to an example 1 correspondingly. The number of heights with a height [coarseness / center line average / on 0.10 micrometers and a straight line with an arbitrary length of 1mm] of 0.5-1.0 micrometers 12 pieces, Although sticking was not generated when the polarizing plate

with which the number of the heights of height ** of 1.0 micrometers has the detailed irregularity structure of 2H in one piece, and surface hardness has it on a front face by the pencil degree of hardness was obtained and the color type liquid crystal display was formed using it It was the display which is hard to see, and when equipment was disassembled, it had generated with the blemish on any polarization separation sheet.

[0037] It applies correspondingly to an example 1 that there is nothing using an example of comparison 3 spherical resin particle (blending [no]) etc. The number of heights with a height [coarseness / center line average / on 0.01 micrometers / or less / and a straight line with an arbitrary length of 1mm] of 0.5-1.0 micrometers Zero piece, When the polarizing plate with which the number of the heights of height ** of 1.0 micrometers has zero piece by the pencil degree of hardness, and surface hardness has the smooth front face of 2H was obtained and the color type liquid crystal display was formed using it, it was the display sticking is hard to try to generate. in addition, equipment -- decomposing -- the polarization separation sheet of each-other gap -- getting damaged -- there was nothing

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The cross section of an example

[Drawing 2] The cross section of other examples

[Drawing 3] Explanatory drawing of heights height

[Drawing 4] The cross section of the example of application

[Description of Notations]

1: Polarizing plate

11, 15, 16: Detailed irregularity structure 12 14: Transparent protection layer

13: Polarization film 17: Glue line

4: Liquid crystal cell

5, 6, 7: Optical sheet

[Translation done.]

(19)日本国特許庁 (JP)

(12) 公開特許公報 (A)

(11)特許出願公開番号

特開2000-162438

(P2000-162438A)

(43)公開日 平成12年6月16日(2000.6.16)

(51)Int.Cl'

G 02 B 5/30

G 02 F 1/1335

識別記号

5 1 0

F I

G 02 B 5/30

G 02 F 1/1335

マーク(参考)

2 H 0 4 9

5 1 0 2 H 0 9 1

審査請求 未請求 請求項の数3 FD (全5頁)

(21)出願番号

特願平10-353890

(22)出願日

平成10年11月26日(1998.11.26)

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最終頁に続く

(54)【発明の名称】 偏光板

(57)【要約】

【課題】 偏光分離シートと隣接配置してもその傷付きを防止でき、かつスティッキングも有効に防止できる偏光板の開発。

【解決手段】 片表面又は両表面に、中心線平均粗さが0.01~0.1μmであると共に、任意な長さ1mmの直線上に高さ0.5~1.0μmの凸部が10個以上、かつ高さ1.0μm超の凸部が2個以下であり、表面硬度が鉛筆硬度にてH~4Hの微細凹凸構造(11)を有する偏光板(1)。

【効果】 スティッキングを防止できると共に、隣接光学シートが軟質膜からなる場合にもその傷付きを防止して、輝度や表示品位等に優れる液晶表示装置を形成できる。



【特許請求の範囲】

【請求項1】 片表面又は両表面に、中心線平均粗さが0.01~0.1μmであると共に、任意な長さ1mmの直線上に高さ0.5~1.0μmの凸部が10個以上、かつ高さ1.0μm超の凸部が2個以下であり、表面硬度が鉛筆硬度にてH~4Hの微細凹凸構造を有することを特徴とする偏光板。

【請求項2】 請求項1において、微細凹凸構造が平均粒径0.5~5μmの球状粒子を含有する紫外線硬化樹脂層からなる偏光板。

【請求項3】 請求項1又は2において、液晶セルの視認背面側における液晶セルと光学シートの間に配置された状態にある偏光板。

【発明の詳細な説明】

【0001】

【発明の技術分野】 本発明は、隣接光学シートの傷付きを防止しつつスティッキングを防止できて液晶表示装置の形成などに好適な偏光板に関する。

【0002】

【背景技術】 バックライトの上に例えば拡散シートや集光シートや偏光分離シート等からなる光学シートを介して偏光板と液晶セルを順次配置した液晶表示装置が提案されている。かかる配置構造は、バックライトによる出射光を拡散シートで拡散させたのち集光シートでその光路を制御して偏光分離シートに導入し、前記出射光を偏光に変換して偏光板に導入することにより光の利用効率を向上させて液晶表示装置の輝度を向上させるようにしたものである。しかし、偏光板と隣接の光学シートが密着してスティッキング現象を起し、表示品位が低下する難点があった。

【0003】 前記に鑑みて本発明者らは、偏光板と隣接の光学シートとのスティッキングを防止するため、従来、防眩等を目的に表示装置の視認側に配置されるアンチグレア偏光板として公知の、表面に凹凸構造を有するものを液晶セルの光源側に配置することを試みた。

【0004】 しかしながら、それによりスティッキングは防止されたものの、偏光板のアンチグレア表面の凹凸構造にて隣接の光学シートが傷付き等で損傷される問題点のあることが判明した。特に、前記した偏光分離シートが偏光板に隣接した場合、かかる偏光分離シートは屈折率異方性の多層膜を有する直線偏光分離シートやコレステリック液晶層を有する円偏光分離シート等の如く平滑表面からなってスティッキングを生じやすい反面、軟質膜であるために傷付きやすく、その傷が散乱点等となって光学機能を阻害し表示品位が著しく低下する。

【0005】

【発明の技術的課題】 本発明は、偏光分離シートと隣接配置してもその傷付きを防止でき、かつスティッキングも有効に防止できる偏光板の開発を課題とする。

【0006】

【課題の解決手段】 本発明は、片表面又は両表面に、中心線平均粗さが0.01~0.1μmであると共に、任意な長さ1mmの直線上に高さ0.5~1.0μmの凸部が10個以上、かつ高さ1.0μm超の凸部が2個以下であり、表面硬度が鉛筆硬度にてH~4Hの微細凹凸構造を有することを特徴とする偏光板を提供するものである。

【0007】

【発明の効果】 本発明によれば、上記した微細で、適度な表面硬度を有する微細凹凸構造に基づいて、隣接の光学シートとのスティッキングを有効に防止できると共に、その隣接光学シートが偏光分離シート等の軟質膜からなる場合にもその傷付きを防止して、輝度や表示品位等に優れる液晶表示装置を形成できる偏光板を得ることができる。

【0008】

【発明の実施形態】 本発明による偏光板は、片表面又は両表面に、中心線平均粗さが0.01~0.1μmであると共に、任意な長さ1mmの直線上に高さ0.5~1.0μmの凸部が10個以上、かつ高さ1.0μm超の凸部が2個以下であり、表面硬度が鉛筆硬度にてH~4Hの微細凹凸構造を有するものからなる。その例を図1、図2に示した。1が偏光板で、11, 15, 16が微細凹凸構造面である。

【0009】 表面上に微細凹凸構造を付与する対象の偏光板には適宜なものを用いることができ、その種類については特に限定はない。ちなみにその例としては、ポリビニルアルコール系フィルムや部分ホルマール化ポリビニルアルコール系フィルム、エチレン・酢酸ビニル共重合体系部分ケン化フィルムの如き親水性高分子フィルムに、ヨウ素や二色性染料等の二色性物質を吸着させて延伸したもの、ポリビニルアルコールの脱水処理物やポリ塩化ビニルの脱塩酸処理物の如きポリエン配向フィルム等の偏光フィルムなどがあげられる。偏光フィルムの厚さは、5~80μmが一般的であるが、これに限定されない。

【0010】 また図例の如く前記した偏光フィルム13の片面又は両面に耐水性等の保護目的で、ポリマーの塗布層やフィルムのラミネート層等からなる透明保護層12, 14を設けたものなどがあげられる。透明保護層の形成には、透明ポリマーなどの適宜なものを用いだが、透明性や機械的強度、熱安定性や水分遮蔽性などに優れるものが好ましく用いられる。また透明保護層は、位相差等の光学的異方性が少ないほど好ましい場合が多い。透明保護層の厚さは、10~300μmが一般的であるが、これに限定されない。

【0011】 ちなみに前記の透明保護層を形成するポリマーとしては、例えばポリエチレンテレフタレートやポリエチレンナフタレートの如きポリエステル系ポリマ

50 一、二酢酸セルロースや三酢酸セルロースの如きセルロ

ース系ポリマー、ポリカーボネート系ポリマーやポリメチルメタクリレート(PMMA)の如きアクリル系ポリマー、ポリスチレンやアクリロニトリル・スチレン共重合体(AS樹脂)の如きスチレン系ポリマーなどがあげられる。

【0012】また、ポリエチレンやポリプロピレン、シクロ系ないしノルボルネン構造を有するポリオレフィンやエチレン・プロピレン共重合体の如きオレフィン系ポリマー、塩化ビニル系ポリマー、ナイロンや芳香族ポリアミドの如きアミド系ポリマー、イミド系ポリマーやスルホン系ポリマー、ポリエーテルスルホン系ポリマーやポリエーテルエーテルケトン系ポリマー、ポリフェニレンスルフィド系ポリマーやビニルアルコール系ポリマー、塩化ビニリデン系ポリマーやビニルブチラール系ポリマー、アリレート系ポリマーやポリオキシメチレン系ポリマー、エポキシ系ポリマーや前記ポリマーのブレンド物なども前記透明保護層を形成するポリマーの一例としてあげられる。

【0013】本発明による偏光板は、図例の如くその片面又は両表面に微細凹凸構造11, 15, 16を有し、その微細凹凸構造が中心線平均粗さ0.01~0.1μmであると共に、任意な長さ1mmの直線上に高さ0.5~1.0μmの凸部を10個以上有し、かつ高さ1.0μm超の凸部が2個以下であり、鉛筆硬度に基づく表面硬度がH~4Hのものからなる。

【0014】前記の微細凹凸構造における中心線平均粗さが0.01μm未満ではスティッキングを防止できず、0.1μmを超えると傷付きが発生する。また微細凹凸構造の表面に任意な長さ1mmの直線を設けた場合に、その線上に位置する高さ0.5~1.0μmの凸部が10個未満ではスティッキングを防止できず、高さ1.0μm超の凸部が2個を超えると傷付きを発生する。

【0015】さらに、表面硬度が鉛筆硬度にてH未満では微細凹凸構造側に傷付きが生じやすくなつて作業時等の取扱性が低下し、4Hを超えると隣接光学シートに傷付きが生じる。なお図3に例示の如く、前記の高さhは、微細凹凸構造の表面19における凸部18の頂点と、それに隣接の凸部との間の最底部との間の距離に基づく。

【0016】傷付き防止とスティッキング防止のバランスの点より好ましい微細凹凸構造は、中心線平均粗さが0.02μm以上、就中0.03μm以上、特に0.04~0.09μm、任意な長さ1mmの直線上における高さ0.5~1.0μmの凸部の個数が50個以上、就中100個以上、特に150個以上で、高さ1.0μm超の凸部の個数が1個以下、就中0個であり、鉛筆硬度に基づく表面硬度が2H~3Hのものである。

【0017】偏光板の表面における微細凹凸構造は、上記した特性を有するものであればよく、適宜な方式で形

成されたものであつてよい。ちなみにその例としては、サンドブラストやエンボスロール、化学エッチング等の適宜な方式で粗面化処理して表面に微細凹凸構造を付与したもの、金型による転写方式等にて表面に微細凹凸構造を付与したもの、微粒子を分散含有する樹脂層などがあげられる。

【0018】従つて微細凹凸構造は、例えば図1や図2に例示したもの11, 16の如く、上記した偏光板における透明保護層の表面に微細凹凸構造を付与してなる透明保護層を兼ねる層などとして形成することができる。

【0019】また微細凹凸構造は、図2に例示したもの15の如く、偏光板の透明保護層12に対する前記樹脂層の塗工層等からなる付加層や、透明保護層に塗工付加したポリマー層の表面に微細凹凸構造を付与した加工層、あるいは前記の表面に微細凹凸構造を付与した透明保護層の上にポリマーの塗工層を設けたものなどとしても形成することができる。微細凹凸構造は、前記した2種以上の状態のものを複合させた層として形成されてもよい。

【0020】前記において、上記した凹凸特性の形成性などの点よりは、偏光板の透明保護層を兼ねる又は透明保護層に代わる層として形成した微粒子含有の樹脂層からなるものが好ましい。その樹脂層は、例えば樹脂溶液に微粒子を分散含有させてそれをドクターブレード法やグラビアロールコータ法等の適宜な方式で偏光板上に塗工して塗工膜を形成する方式や、微粒子含有の樹脂フィルムを予め形成してそれを偏光板上に接着する方式などの適宜な方式にて形成することができる。

【0021】なお前記の樹脂層を形成する樹脂には、上記した透明保護層にて例示したポリマーなどをその硬度などに応じて適宜に用いよう。好ましく用いいうものは紫外線硬化型樹脂である。これによれば、紫外線照射による塗工層の硬化処理にて必要に応じ微粒子を含有する紫外線硬化樹脂層からなる層を簡単な加工操作にて効率よく形成することができる。また粗面化した透明保護層の表面に紫外線硬化樹脂層を形成してその表面に透明保護層の表面凹凸を反映させることなども容易に行うことができる。

【0022】前記の紫外線硬化型樹脂としては、例えばポリエステル系やアクリル系、ウレタン系やアミド系、シリコーン系やエポキシ系等の樹脂を形成しうるモノマー・オリゴマー・ポリマーに紫外線重合開始剤を配合して、紫外線照射による硬化処理で樹脂層を形成しうるようとしたものなどの適宜なものを用いよう。

【0023】好ましく用いいう紫外線硬化型樹脂は、例えば紫外線重合性の官能基を有する、就中2個以上、特に3~6個有するアクリル系のモノマー・オリゴマーを成分とするものの如く、付設対象の偏光板表面に対する密着性、透明性やハードコート性、微粒子を含有させる場合にはその分散性、硬化皮膜の上記硬度の満足性など

に優れるものである。

【0024】なお前記の微粒子としては、例えばPMMAやポリウレタン、ポリスチレンやメラミン樹脂等の各種ポリマーからなる架橋又は未架橋の有機系粒子、シリカやアルミナ、チタニアやジルコニア、酸化カルシウムや酸化錫、酸化インジウムや酸化カドミウム、酸化アンチモン等の導電性のこともある無機系粒子などの適宜なものを用いる。

【0025】就中、上記した凹凸特性の容易な達成性や鋭角な凸部の形成防止などの点よりは球状粒子、特に硬化前の樹脂に溶解しない有機系粒子が好ましく用いる。また用いる微粒子は、傷付き防止とスティッキング防止を良好にバランスさせる点などより、その平均粒径が0.5~5μm、就中1~4μmのものが好ましい。

【0026】偏光板には、図2に例示した如く必要に応じて接着層17を設けることもできる。かかる接着層は、偏光板を液晶セル等の他部材と接着することを目的とするものである。接着層は、例えばアクリル系やゴム系、シリコーン系等の粘着剤やホットメルト系接着剤などの適宜な接着剤にて形成することができ、透明性や耐候性等に優れるものが好ましい。

【0027】本発明による偏光板は、必要に応じ位相差板と接着した楕円偏光板などとして表示装置などの従来に準じた各種の用途に用いる。特に液晶表示装置の如く偏光板に隣接して光学シートを配置する場合に、その光学シートの傷付きを防止しつつ、隣接の光学シートとの間でスティッキングすることの予防が必要な用途などに好ましく用いる。その場合、偏光板はその微細凹凸構造面が隣接の光学シートとの間に位置するように配置される。

【0028】ちなみに図4に、本発明による偏光板1を配置した液晶表示装置を例示した。これは、バックライト8の光出射面に順次光拡散シート7と集光シート6と偏光分離シート5が載置され、その上に偏光板1が配置されて粘着層3を介し液晶セル4に接着されており、その液晶セルの上に粘着層3を介し偏光板2が接着された形態のものとなる。

【0029】前記において光拡散シート、集光シート及び偏光分離シートが光学シートであるが、図例では偏光分離シート5が偏光板1に隣接の光学シートとなっている。そのため偏光板1は、その微細凹凸構造を有する面11が偏光分離シート側となるように配置されている。このように液晶表示装置では、接着層なしに載置する光学シートと液晶セルとの間に本発明による偏光板を配置してスティッキングと傷付きを防止する構造が通例である。また図例の如く液晶セルの視認背面側に本発明による偏光板を配置する方式が一般的であるが、液晶セルの視認側に配置することを制限するものではない。

【0030】なお前記の液晶セルは、内側に透明電極を有するセル基板42の間に液晶層43を封入すると共

に、その視認側にカラーフィルタ41を付設したものとなる。またバックライト8は、ホルダ83で包囲した光源82を側面に配置した導光板81の底面に反射層84を設けてなるサイドライト型のものとなり、その上方の集光シート6は、プリズムシート6a、6bをそれらのプリズム稜線が交差するように配置したものとなる。さらに視認側の偏光板2は、その表面にアンチグレア層21を有するものとなる。

【0031】前記の液晶表示装置によれば、バックライト8による出射光が光拡散シート7にて拡散されて集光シート6に入射し、それで光路が制御されたのち偏光分離シート5に至って反射光と透過光に分離されると共に偏光に変換され、その透過偏光が偏光板1を吸収ロスの少ない状態で通過して液晶層を透過し、視認側の偏光板2を介して表示光が射出される。その場合、偏光板1による吸収ロスが少ないと、及び偏光分離シートによる反射偏光が導光板の反射層84で反射反転して偏光分離シートに再入射して透過し、その反射光の利用で光の利用効率が向上することなどにより、液晶表示装置の輝度を向上させることができる。

【0032】なお前記の図例では、偏光分離シートを偏光板に隣接の光学シートとしたが、本発明にてはそれに限定されず、偏光板に隣接の光学シートは、形成目的の液晶表示装置等の形態に応じた適宜なものであってよい。

【0033】

【実施例】実施例1

ウレタンアクリレート系紫外線硬化型樹脂100部（重量部、以下同じ）、平均粒径2μmの球状樹脂粒子20部、及び紫外線重合開始剤3部を溶媒を介し混合した固形分50重量%の分散液を、ヨウ素系ポリビニルアルコール型偏光フィルムの両面にポリビニルアルコール系接着層を介し厚さ50μmのトリアセチルセルロースフィルムを接着した偏光板の片面にバーコータにて塗布し、乾燥後紫外線を介し硬化処理して、表面微細凹凸構造の偏光板を得た。その表面微細凹凸構造における中心線平均粗さは0.08μm、任意な長さ1mmの直線上における高さ0.5~1.0μmの凸部の個数は240個、高さ1.0μm超の凸部の個数は0個、表面硬度は鉛筆硬度にて2Hであった。

【0034】次に、前記の微細凹凸構造面が外側となるように偏光板をアクリル系粘着層を介して液晶セルに接着し、その微細凹凸構造面を介し屈折率異方性の多層膜を有する直線偏光分離シート又はコレステリック液晶ポリマー層を有する円偏光分離シートの上に載置した図4に準じた形態のカラー型液晶表示装置を形成したところ、スティッキングは発生せず、表示品位にも優っていた。また装置を分解して確認したところ、いずれの偏光分離シートにも傷付きは生じていなかった。

平均粒径が $10\mu m$ の球状樹脂粒子を用いたほかは実施例1に準じて、中心線平均粗さが $0.40\mu m$ 、任意な長さ $1mm$ の直線上における高さ $0.5\sim1.0\mu m$ の凸部の個数が46個、高さ $1.0\mu m$ 超の凸部の個数が12個、表面硬度が鉛筆硬度にて $2H$ の微細凹凸構造を表面に有する偏光板を得、それを用いてカラー型液晶表示装置を形成したところ、スティッキングは発生しなかつたが、見づらい表示であり、装置を分解したところ、いずれの偏光分離シートにも傷付きが発生していた。

【0036】比較例2

平均粒径が $10\mu m$ のシリカ粒子0.5部を用いたほかは実施例1に準じて、中心線平均粗さが $0.10\mu m$ 、任意な長さ $1mm$ の直線上における高さ $0.5\sim1.0\mu m$ の凸部の個数が12個、高さ $1.0\mu m$ 超の凸部の個数が1個、表面硬度が鉛筆硬度にて $2H$ の微細凹凸構造を表面に有する偏光板を得、それを用いてカラー型液晶表示装置を形成したところ、スティッキングは発生しなかつたが、見づらい表示であり、装置を分解したところ、いずれの偏光分離シートにも傷付きが発生していた。

【0037】比較例3

球状樹脂粒子を用いない(無配合)ほかは実施例1に準

じて、中心線平均粗さが $0.01\mu m$ 以下、任意な長さ $1mm$ の直線上における高さ $0.5\sim1.0\mu m$ の凸部の個数が0個、高さ $1.0\mu m$ 超の凸部の個数が0個、表面硬度が鉛筆硬度にて $2H$ の平滑表面を有する偏光板を得、それを用いてカラー型液晶表示装置を形成したところ、スティッキングが発生して見づらい表示であった。なお装置を分解したがいずれの偏光分離シートにも傷付きはなかった。

【図面の簡単な説明】

【図1】実施例の断面図

【図2】他の実施例の断面図

【図3】凸部高さの説明図

【図4】適用例の断面図

【符号の説明】

1：偏光板

11, 15, 16：微細凹凸構造 12, 14：透明保護層

13：偏光フィルム 17：接着層

4：液晶セル

20 5, 6, 7：光学シート

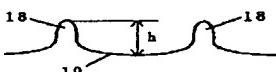
【図1】



【図2】



【図3】



【図4】

